

Overview of User Needs for 2018 NSHM Update and Beyond

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NSHMs Spectral Periods & Site Classes

- Historically, USGS has made and published in OFRs hazard maps for
 - 3 spectral periods (PGA, 0.2sec, 1.0sec) &
 - 1 reference site class (BC)
- Although not in the OFRs and not used by the building codes, USGS has been making hazard maps for additional periods and site classes for many years. WUS 2008 NSHM:
 - 11 spectral periods (PGA, 0.1, 0.2, 0.3, 0.5, 0.75, 1, 2, 3, 4, 5) &
 - 6 site classes (B, BC, C, CD, D, DE)
- Realizing the shortcomings of the current **simple design spectrum**, building code has decided to take advantage of USGS additional maps and has requested additional periods and site classes to develop **multi-period design spectrum** for the next-generation of seismic design value maps for Project '17.
 - 21 “NGA” spectral periods
 - 8 site classes

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Project '17

Project '17: A joint USGS-BSSC effort to develop consensus among practicing engineers and earth science communities engaged in formulating the rules by which next-generation seismic design value maps will be developed. (2021 NEHRP, ASCE 7-22, 2024 IBC)

Initially identified 13 issues as important for consideration in the next-generation of design value maps (4 were selected as primary issues due to limited budget and resources):

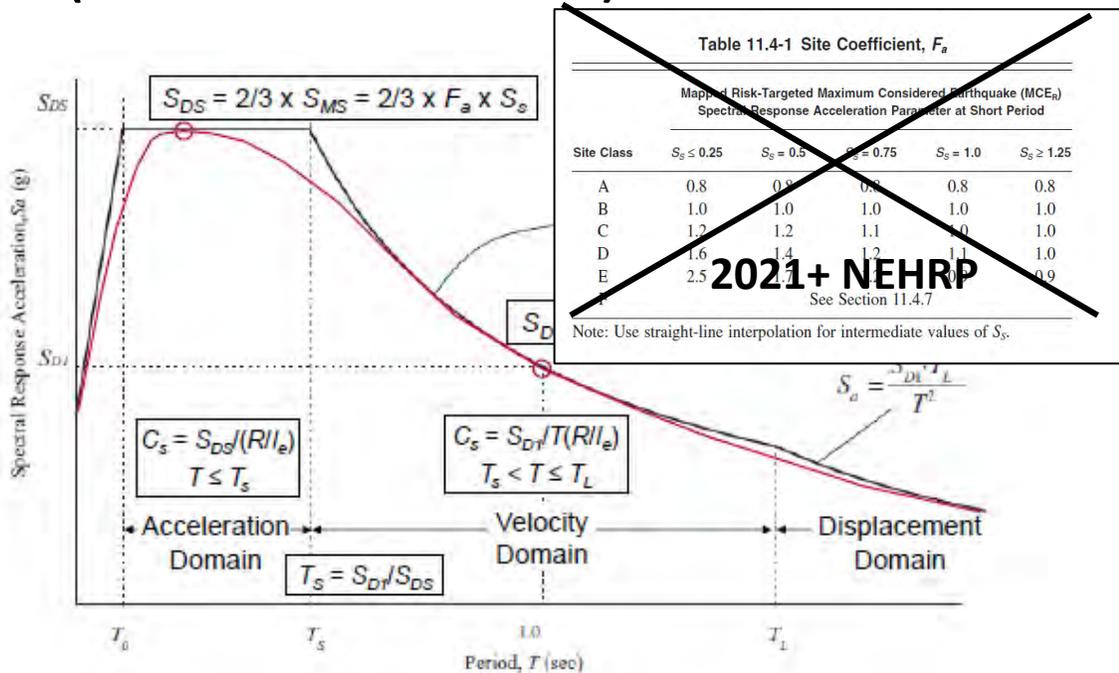
1. Timing for Updated Map Publication
2. Design Value Conveyance
3. Balancing Precision and Uncertainty
4. Acceptable Collapse Risk Definition
5. Collapse Risk Definition
6. Maximum Direction Ground Motion Components
7. Multi-Period Spectral Values
8. Duration as a Mapped Parameter
9. Damping Levels
10. Vertical Motion Parameters
11. Use and Definition of Deterministic Parameters
12. Basin Effects
13. Use of 3-D Simulation to Develop Long Period Parameters

One of the primary issues that will effect 2018 and future USGS NSHMs

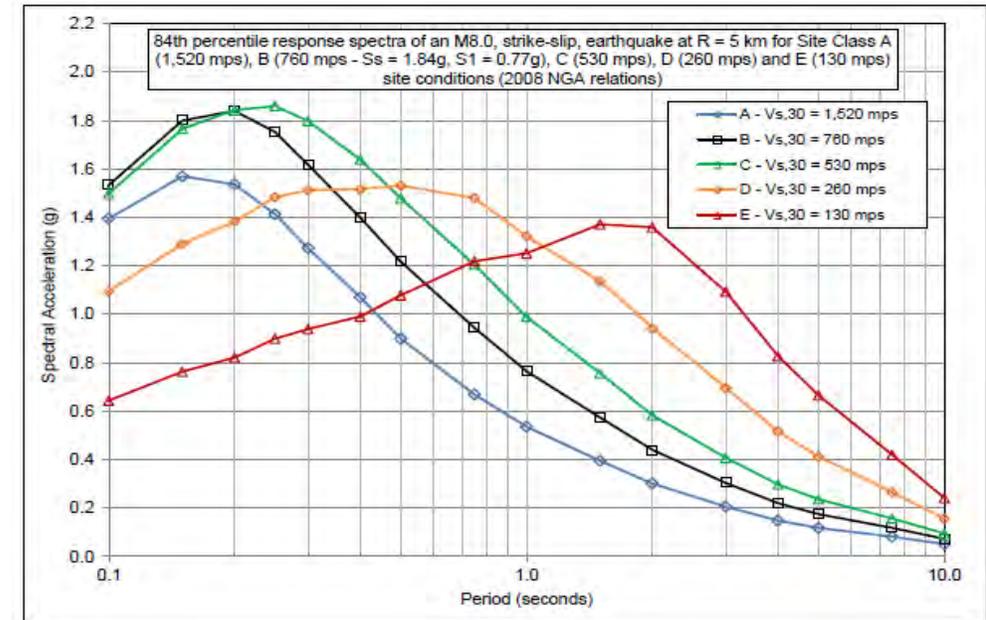
Long period issues that can be combined into issue 7

Multi-Period Response Spectrum (MPRS)

Current Design Spectrum (based on S_s & S_1 for BC):



Multi-T Multi-Vs30 Spectrum:



Future USGS Deliverables:

1. Provide more periods
2. Directly implement Vs30 into GMMs

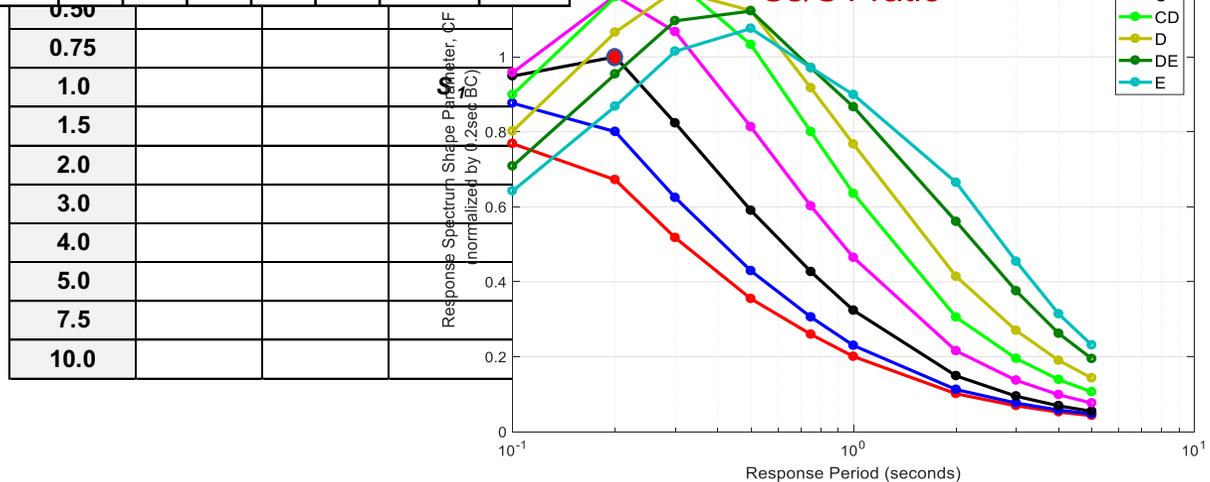
Challenges (Current GMM Shortcomings):

1. What to do in the CEUS (long T, soft soil)?
2. What to do for basin effects in the WYS (long T, soft soil)?
 - GMMs sensitive to Z_x values
 - 3D simulations not mature for 2018

User Needs for 2018 NSHM & Beyond

Provide hazard maps for 21 periods and 8 site classes:

Period		Site Class							
Response Spectrum Shape Parameter CF:									
T (s)	AB	B	BC	C	CD	D	DE	E	
0.00	0.31	0.36	0.42	0.47	0.49	0.47	0.43	0.40	
0.10	0.77	0.88	0.95	0.96	0.90	0.80	0.71	0.64	
0.20	0.67	0.80	1.00	1.16	1.16	1.07	0.95	0.87	
0.30	0.52	0.62	0.82	1.07	1.20	1.18	1.10	1.01	
0.50	0.35	0.43	0.59	0.81	1.03	1.12	1.12	1.08	
0.75	0.26	0.31	0.43	0.60	0.80	0.92	0.97	0.97	
1.00	0.20	0.23	0.32	0.46	0.64	0.77	0.87	0.90	
2.00	0.10	0.11	0.15	0.22	0.31	0.41	0.56	0.66	
3.00	0.07	0.08	0.09	0.14	0.20	0.27	0.38	0.45	
4.00	0.05	0.06	0.07	0.10	0.14	0.19	0.26	0.31	
5.00	0.04	0.05	0.05	0.08	0.11	0.14	0.19	0.23	



- **CEUS:** 2014 GMMs only applicable up to 2sec, and site class A (Need updated GMMs, e.g., NGA-East)
- **WUS & Subduction:**
 - Remove GMMs not applicable for soft sites (Idriss14) & long periods (Atkinson&Boore03) and re-weight GMMs
 - Basin effects for long T and soft sites
- **Other Regions:** AK, HI, GU&AS, PRVI
 - Response Spectrum Shape Factors, developed based on WUS GMMs, until USGS updates are available for each region

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Provide hazard maps for 21 periods and 8 site classes:

Period T (s)	Site Class							
	A	B	BC	C	CD	D	DE	E
PGA								
0.010								
0.020								
0.030								
0.050								
0.075								
0.10								
0.15								
0.20			S_s					
0.25								
0.30								
0.40								
0.50								
0.75								
1.0			S_1					
1.5								
2.0								
3.0								
4.0								
5.0								
7.5								
10.0								

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